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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/707,825	01/15/2004	CHENG-YI LIU	10786-US-PA	1824

31561 7590 12/20/2004

JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE
7 FLOOR-1, NO. 100
ROOSEVELT ROAD, SECTION 2
TAIPEI, 100
TAIWAN

EXAMINER	
GRAYBILL, DAVID E	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 12/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/707,825	LIU ET AL.	
	Examiner	Art Unit	
	David E Graybill	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

In the rejections infra, generally, reference labels are recited only for the first recitation of identical claim elements.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1, 4-6, 9, 10, 12, 14, 16, 17, 19, 21 and 22 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by Yoda (20020061641).

At paragraphs 73, 78, 96-98, 108, 113-116 and claim 16, Yoda discloses the following:

A flip-chip gold bump structure formed on a wafer 10, comprising: at least one gold bump 40; a nickel layer 42 on the gold bump; and a copper layer 42 on the nickel layer; wherein the gold bump has a height from about 3 μm to about 150 μm.

A flip-chip package structure adapted to connect a chip and a chip substrate, comprising: at least one gold bump on the chip 18; a nickel layer on the gold bump; and a solder containing copper 42 on the nickel layer for connecting the chip and the chip substrate; wherein the solder containing

copper includes a solder alloy; wherein the gold bump has a height from about 3 μm to about 150 μm.

A method of fabricating a flip-chip gold bump structure formed on a wafer, comprising: forming at least one gold bump on the wafer; forming a nickel layer on the gold bump; and forming a copper layer on the nickel layer; wherein the step of forming the gold bump includes electroless plating; wherein the step of forming the nickel layer on the gold bump includes electroless plating; wherein the step of forming the copper layer on the nickel layer includes electroless plating.

A method of fabricating a flip-chip package adapted to connect a chip and a chip substrate, comprising: forming at least one gold bump on a wafer; forming a nickel layer on the gold bump; sawing the wafer; forming a solder containing copper on the chip substrate 60 "60 and the bumps 50 are electrically connected"; and inherently aligning the gold bump to the solder containing copper; wherein the step of forming the gold bump on the wafer includes electroless plating; wherein the step of forming the nickel layer on the gold bump includes electroless plating; a reflow process "subjecting to a reflow process" after aligning the gold bump to the solder containing copper.

To further clarify the disclosure of the particular claimed layer arrangement, it is noted that Yoda discloses that the particular claimed

materials are arranged in any order; therefore, the scope of the disclosure encompasses the particular claimed order.

Also, to further clarify, Yoda discloses a solder containing copper because Yoda discloses "copper tin" and, "a metal including tin and at least one selected from Ag, Cu," and these materials are solder because they are metallic alloys that can be used when melted to join metallic surfaces.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 3, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoda (20020061641).

Yoda is applied for the same reasons it is applied supra.

However, Yoda does not appear to explicitly disclose the particular claimed copper concentration.

Regardless, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose the particular claimed

copper concentration because applicant has not disclosed that, in view of the applied prior art, the concentration is for a particular unobvious purpose, produce an unexpected result, or is otherwise critical, and it appears prima facie that the process would possess utility using another concentration. Indeed, it has been held that optimization of range limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See MPEP 2144.05(II): "Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. '[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.'" In re Aller, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). See also In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969), Merck & Co. Inc. v. Biocraft Laboratories Inc., 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989), and In re Kulling, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990). As set forth in MPEP 2144.05(III), "Applicant can rebut a prima facie case of obviousness based on overlapping ranges by showing the criticality of the claimed range. 'The law is replete with cases in which the

difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.' In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). See MPEP § 716.02 - § 716.02(g) for a discussion of criticality and unexpected results."

Also, Yoda does not appear to explicitly disclose the particular claimed layer thicknesses.

Still, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular thicknesses because applicant has not disclosed that, in view of the applied prior art, the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using other thicknesses. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); Gardner v. TEC Systems, Inc., 725 F.2d 1338,

220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Claims 1-10, 12, 14, 16, 17, 19, 21 and 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Yoda (20020061641).

Yoda is applied as it applied to claims 1-10, 12, 14, 16, 17, 19, 21 and 22 supra.

However, Yoda does not appear to explicitly disclose the particular claimed layer arrangement.

Nonetheless, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to arrange the layers of Yoda as claimed because applicant has not disclosed that, in view of the applied prior art, the arrangement is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical, and it appears prima facie that the process would possess utility using another arrangement. Moreover, it has been held that limitations directed to rearrangement of parts are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. In re Japikse 86 USPQ 70 (CCPA 1950); for example, reversal of parts was held to have been obvious. In re Gazda 104 USPQ 400 (CCPA 1955).

Moreover, "simple adjustment of spatial orientation" has been held to be obvious. Colt Industries Operating Corp. v. Index Werke, K.G. et al., 217 USPQ 1176 (DC 1982).

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoda as applied to claim 7 supra, and further in combination with Amagai (6762506).

Yoda does not appear to explicitly disclose the particular claimed copper concentration.

Nevertheless, at column 2, lines 9-16; column 3, lines 5-12; column 4, line 66 to column 5, line 2; and column 53 to column 7, line 5, Amagai discloses this copper concentration. Moreover, it would have been obvious to combine this disclosure with the disclosure of Yoda because it would improve the layer reliability.

Claims 11, 13, 15, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoda as applied to claims 10 and 17, and further in combination with Takano (20020173108).

Yoda does not appear to explicitly disclose electroplating the gold bump and nickel and copper layers.

Notwithstanding, as cited, Yoda discloses electroless plating the gold bump and nickel and copper layers. Furthermore, at paragraphs 71 and 73,

Takano discloses that electroless plating and electroplating are alternatives and equivalents; therefore, it would have been obvious to substitute or combine the electroplating of Takano for or with the electroless plating of Yoda. See In re May (CCPA) 136 USPQ 208 (It is our opinion that the substitution of Wille's type seal for the cement of Hallauer in Figure 1 would be obvious to persons of ordinary skill in the art from the disclosures of these references, merely involving an obvious selection between known alternatives in the art and the application of routine technical skills.); In re Cornish (CCPA) 125 USPQ 413; In re Soucy (CCPA) 153 USPQ 816; Sabel et al. v. The Wickes Corporation et al. (DC SC) 175 USPQ 3; Ex parte Seiko Koko Kabushiki Kaisha Co. (BdPatApp&Int) 225 USPQ 1260; and Ex parte Rachlin (BdPatApp&Int) 151 USPQ 56. See also Smith v. Hayashi, 209 USPQ 754 (Bd. of Pat. Inter. 1980) (However, there was evidence that both phthalocyanine and selenium were known photoconductors in the art of electrophotography. "This, in our view, presents strong evidence of obviousness in substituting one for the other in an electrophotographic environment as a photoconductor." 209 USPQ at 759.). An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. In re Fout, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). "It is prima facie obvious to combine two

compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art." In re Kerkhoven, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980) (citations omitted). See also In re Crockett, 279 F.2d 274, 126 USPQ 186 (CCPA 1960); Ex parte Quadranti, 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992).

The art made of record and not applied to the rejection is considered pertinent to applicant's disclosure. It is cited primarily to show inventions similar to the instant invention.

For information on the status of this application applicant should check PAIR: Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alternatively, applicant may contact the File Information Unit at (703) 308-2733. Telephone status inquiries should not be directed to the examiner. See MPEP 1730VIC, MPEP 203.08 and MPEP 102.

Any other telephone inquiry concerning this communication or earlier communications from the examiner should be directed to David E. Graybill at (571) 272-1930. Regular office hours: Monday through Friday, 8:30 a.m. to 6:00 p.m.
The fax phone number for group 2800 is (703) 872-9306.

David E. Graybill
Primary Examiner
Art Unit 2827

D.G.
12-Dec-04